

# **Sensitive Plant Species in Weed Management Areas on the Helena National Forest**

Final Report

Prepared for the:

**Helena National Forest**

by

**Drake Barton and Susan Crispin**

**Montana Natural Heritage Program**  
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Prepared for the  
Helena National Forest  
Helena, Montana

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by  
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## EXECUTIVE SUMMARY

The purpose of this work was to document occurrences of U.S. Forest Service (USFS) Sensitive Plant Species on the Helena National Forest for the development of a weed Environmental Impact Statement and to provide information for current weed treatment efforts on the Forest. A secondary objective was to gather additional distribution and habitat information on Sensitive plant species in the Helena National Forest. The sites surveyed include known occurrences of Sensitive plant species, as well as potentially suitable locations as predicted by habitat modeling conducted by the Montana Natural Heritage Program (MTNHP).

Habitat modeling for Sensitive Species identified 646 sites with potential habitat in or near areas targeted for weed treatment. Of these, we surveyed or sampled 435 potential habitat polygons and documented USFS Sensitive Species at 24 locations. Sixteen were newly documented, five previously known occurrences were revisited and new sub populations were added or existing population numbers were significantly expanded. Additionally, three sites were revisited and the populations were confirmed. These included seven occurrences of *Polygonum douglasii* spp. *austinae* (Austin's knotweed), fourteen occurrences of *Cirsium longistylum* (long-styled thistle), and three occurrences of *Phlox kelseyi* var. *missoulensis* (Missoula phlox). Two previously documented occurrences were sought but not relocated. We did not locate any *Grindelia howellii* (Howell's gumweed) on Helena National Forest lands. Two localities for *Botrychium paradoxum* (peculiar moonwort) were reported by USFS staff in 2001, one of which we revisited in 2002.

In addition to the USFS Sensitive species that were specifically targeted, we also identified new occurrences of *Draba densifolia* (dense-leaf draba), and *Astragalus convallarius* var. *convallarius* (lesser rushy milkvetch). Neither of these taxa is currently considered USFS Sensitive, however they are Montana Species of Concern, ranked S2 by MTNHP.

Many of these Sensitive Species are successional and are often found in disturbed habitats. *Polygonum douglasii* spp. *austinae* and *Cirsium longistylum* are often found along roadways, a vector for the spread of weeds. *Botrychium paradoxum* and *Astragalus convallarius* var. *convallarius* are found in rough fescue grasslands that are quickly being invaded by weeds such as spotted knapweed (*Centaurea maculosa*) and Dalmatian toadflax (*Linaria dalmatica*). When Sensitive Species are located in relatively weed free areas, monitoring these sites to catch any weed infestations early will help to preserve the quality of these habitats.

Weed treatments in areas with populations of Sensitive plants can be designed to reduce negative impacts to these species. Most important are avoiding overspray of herbicides and, when possible, spot spraying to specifically target weed species. Herbicide applications can also be timed to minimize damage to Sensitive plant populations. In some cases, care will be needed to correctly identify target weed species, especially since *Cirsium longistylum* can be easily mistaken for weedy thistles.

Weeds impact the quality of the habitat for Sensitive plant species, and effective weed treatment will be important for the long-term viability of Sensitive plant populations on National Forest lands.

## **ACKNOWLEDGEMENTS**

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## INTRODUCTION

The Helena National Forest extends over the Big Belt Mountains, the Elkhorns, the Continental Divide area north and south of Helena, and into the Scapegoat Mountains bordering the Blackfoot River valley. These areas support several plant taxa ranked as globally significant by the Natural Heritage Network (NatureServe Explorer 2002) including two endemic to Montana, as well as numerous plants species of state-level significance (see Appendix A for information on the Natural Heritage ranking system).

The purpose of this project was to document the occurrence of plant species designated as Sensitive by the U.S. Forest Service (USFS) in areas targeted for weed management on the Helena National Forest (HNF). This information is needed for the development of an Environmental Impact Statement in order to minimize negative impacts of weed treatments on Sensitive plant species. Since many Sensitive plant species are themselves at risk from competition by invasive weeds, effective weed control programs will be important to these species' future viability on USFS lands.

In the early 1990s, botanists with the Montana Natural Heritage Program (MTNHP) conducted extensive rare plant surveys in the Big Belt and Elkhorn Mountains (Poole & Heidel 1993), which generated a great deal of new information on the distribution and habitats of Sensitive plant species in the Helena National Forest. That information was used to focus our current surveys on weed treatment areas most likely to support Sensitive Species' habitat. These surveys, in turn, provided an opportunity to test our assumptions and expand our knowledge regarding these species' habitat characteristics and distribution.

Current survey work focused on areas where Sensitive plant species had been documented, or were predicted, in or near proposed weed treatment sites, as identified by the Helena National Forest. We also surveyed potential habitats in the general vicinity of, or along the route to, these weed

treatment sites. In addition to Forest Service Sensitive Species, we opportunistically documented any other Montana Plant Species of Concern (Heidel 2001) not currently designated USFS Sensitive, including those known from areas adjacent to the National Forest but not previously documented on the Helena National Forest.

## METHODS

### Potential Habitat Modeling Analysis

In 2001, we developed some relatively simple models to help predict potential habitat for Sensitive Species in the Helena National Forest (Weber & Crispin 2001). First, we identified USFS Sensitive plant species (using a list provided by HNF staff) that were likely to occur in or near mapped weed treatment areas on the Forest. Five HNF Sensitive Species were thus identified: *Cirsium longistylum* (long-styled thistle), *Grindelia howellii* (Howell's gumweed), *Phlox kelseyi* var. *missoulensis* (Missoula phlox), *Polygonum douglasii* ssp. *austinae* (Austin's knotweed), and *Botrychium paradoxum* (peculiar moonwort). All were previously documented on the HNF, with the exception of *Grindelia howellii*. Because a possible sighting of *Botrychium crenulatum* (wavy moonwort) was reported in 2001, this species was also targeted for surveys.

For Sensitive Species known to occur on the Forest, we analyzed location records from the MTNHP databases using 30-meter Digital Elevation Models (DEMs) to determine the range of aspect, elevation, and slope values for those locations. Soil types were determined using the Landtype variable within the Landwaters GIS coverage provided by HNF staff. Likewise, characteristic vegetation types for each species were derived using individual forest unit vegetation coverages.

With this information, we modeled potential habitat for the four Sensitive Species with confirmed occurrences on the Forest using five variables: aspect, elevation, slope, soil type, and vegetation

type. By correlating these potential habitat areas with spatial data on weed infestations mapped by the HNF, we identified 646 points or polygons where potential sensitive species habitats fell within 50 feet of mapped weed infestations. No known occurrences of *Grindelia howellii* fell within the HNF Landwaters and vegetation coverages, so we were unable to model potential habitat for that species. However, *Grindelia howellii* is known to occur along roadsides in the Blackfoot Valley west of Lincoln, and surveys could be effectively conducted along roadways in that area.

### Field Surveys

Field botanists were provided with maps that showed the modeled potential habitat polygons in weed treatment areas, as well as other potential habitat in the vicinity. A GPS coordinate was provided for each of these survey areas to help pinpoint the correct location. Within a general area, such as a drainage, at least 30% to 60% of the total mapped potential habitat polygons in weed treatment areas were surveyed by field botanists. These sampling sites were selected in the field based on apparent habitat suitability and accessibility, and included at least one sampling point where we had mapped numerous potential habitat polygons. If the surveyor located a Sensitive Species in a sampling site, then the search was expanded to include nearby weed treatment areas with potential habitat.

Using this approach, we were able to sample proposed weed treatment areas with potential Sensitive Species habitat in the Big Belt Mountains, the Blackfoot and Divide Landscapes, as well as the Elkhorn Mountains. Altogether, 435 of the 646 individual polygons of potential habitat identified by our modeling were surveyed on the ground – 268 in 2001, and 167 in 2002.

Fieldwork in 2001 began late in the year and therefore focused on three species with a later growing season. *Cirsium longistylum* (long-styled thistle), a fairly large plant, is identifiable long past the flowering season using the durable involucre bracts that subtend the flower/seed head.

*Polygonum douglasii* ssp. *austinae* (Austinis knotweed) is a plant that remains in flower late in the season. The fruits that develop late in the year provide a helpful diagnostic feature that, along with leaf shape, distinguish this plant from a far more common close relative, *Polygonum douglasii* ssp. *douglasii*. *Grindelia howellii* (Howell's gumweed) is a late-flowering plant that is also identifiable long after the flowering season by using the distinctive involucre bracts and the glandular nature of the plant as distinguishing features.

Most of the 2001 fieldwork was concentrated in the eastern portion of the Forest in the Big Belt Mountains. Based on existing records, this area had the highest potential for supporting *Polygonum douglasii* ssp. *austinae* and *Cirsium longistylum*. Surveys for *Cirsium longistylum* and *Polygonum douglasii* ssp. *austinae* were less intensive in the Blackfoot and Divide Landscapes, owing to the fact that there are no historical records from that portion of the HNF for either of these species. Sampling there focused on areas where our habitat models predicted potential habitat for more than one target species. Lower elevations along roadsides in the Lincoln area were surveyed for *Grindelia howellii* during 2001.

In 2002, field surveys began early enough to identify *Phlox kelseyi* var. *missoulensis* (Missoula phlox). These plants are best identified using a combination of flower size, leaf size, and over-all plant size. They closely resemble several other members of the *Phlox* genus and at times cannot be separated with total assurance. Later summer surveys included *Botrychium paradoxum* (peculiar moonwort) and *Botrychium crenulatum* (wavy moonwort) – both small, fern-like plants. *Botrychium paradoxum* is characterized by the absence of a leafy stalk, which is replaced by a second sporophore. *Botrychium crenulatum* is similar to the more common *B. lunaria*, but is substantially smaller, with smaller and more separated leaves. Additional potential habitat areas for *Cirsium longistylum* and *Polygonum douglasii* ssp. *austinae* were also surveyed later in the summer of 2002. No additional survey work was conducted for *Grindelia howellii* in 2002.

When a Sensitive Species was located, we completed a Plant Species of Concern Field Survey Form. This records the surveyor, date and location (Township, Range and ° Section), as well as detailed quantitative and qualitative information about the size and condition of the population, habitat, environmental conditions, and associated plant species (including a full species list). GPS coordinates and reference photographs were taken, and survey tape was left to mark each population.

All data collected on USFS Sensitive Species and other Species of Concern were entered into the MTNHP data system, either as new records or updates to previous records. Each new occurrence was assigned an Element Occurrence (EO) rank of A through D based on our assessment of its quality and viability. Ranking factors include population size (numbers of plants and aerial extent), vigor, evidence of reproduction, condition of the plant community at the site, presence of exotic species, signs of threats or habitat degradation, and natural integrity of the surrounding landscape (*Draft Element Occurrence Data Standard* 1999).

When a search failed to locate any of the targeted species, a Negative Survey Form was completed that documented the surveyor, date, site location, species sought, results and the conclusions of the surveyor (e.g., whether follow-up surveys were recommended). We also compiled species lists and took reference photos for these sites. For each negative survey thus documented, we created a unique record in a Survey database. Negative survey records from the 2002 field season are being provided as supplementary materials to the Helena National Forest.

Nomenclature for the plant lists generally follows Dorn, *Vascular Plants of Montana* (1984). However, some of the lists include nomenclature based on the flora checklist for the HNF that was begun during 1993 surveys by MTNHP; that list follows Hitchcock, *Flora of the Pacific Northwest* (1976).

## RESULTS

Of the 435 potential habitat polygons surveyed, USFS Sensitive Species were found at 24 locations, sixteen of which were newly documented. Nine previously known occurrences were revisited and confirmed or expanded and two occurrences were sought but not relocated. The 24 locations include seven occurrences of *Polygonum douglasii* spp. *austinae*, fourteen occurrences of *Cirsium longistylum*, and three occurrences of *Phlox kelseyi* var. *missoulensis*. We did not locate any *Grindelia howellii* on Helena National Forest lands.

In addition to the USFS Sensitive Species that were specifically targeted in our surveys, we identified two new occurrences of *Draba densifolia*, and one new occurrence of *Astragalus convallarius* var. *convallarius*. Neither of these taxa is currently considered USFS Sensitive, however they are Montana Species of Concern, ranked S2 by MTNHP (Heidel 2001).

Our report also includes two localities for *Botrychium paradoxum* reported by USFS staff in 2001, one of which we revisited in 2002. Tables below summarize the 29 populations or subpopulations of USFS Sensitive Species and Montana Species of Concern that we documented on Helena National Forest lands.

Based upon the data collected, new maps were generated that depict all known occurrences of Sensitive Species and other Species of Concern (new and previously documented) as well as negative survey locations. These maps are included in Appendix B. Selected photos of Sensitive Species and habitats are included in Appendix C.

Each Sensitive Species or other Species of Concern that was documented during our surveys is described below, along with a brief summary of each occurrence. Unless otherwise noted, these summaries do not represent all occurrences within the Helena National Forest for any given species.

## ***Polygonum douglasii* ssp. *austinae* (Austinís knotweed)**

*Polygonum douglasii* ssp. *austinae* was found at seven locations, three of which were previously known. Table 1 lists the location, habitat, population size and comments about each of the seven occurrences.

**Table 1: Occurrences of *Polygonum douglasii* ssp. *austinae***

Drainage Location	Element Occurrence # Quad	T/R/Section	Habitat/ Veg.	Size of Population	EO Quality	Comments
Burnt Gulch, Pike Creek	EO.005 Hogback	T13N R1E S19	Barren roadside, bluebunch wheatgrass	More than 1000	A	Revisited site, lots of individual plants
Dry Creek	EO.006 Deer Park	T6N R4E S25, 30	Barren hillside, bluebunch wheatgrass	Approx. 300	BC	A new subpopulation was marked in Sec. 30 on USFS lands
Dry Creek	EO.007 (includes EO.013) Sixmile Mountain	T6N R4E S27	Barren hillside, bluebunch wheatgrass	Over 1000	AB	Revisited site, populations healthy. New subpopulation added to existing population. Combines EO.007 and .013
Indian Flats	EO.015 Hogback	T13N R1W S36	Rocky scree, disturbed vegetation	Less than 40	C	New location along road that has other populations
Kingsberry Gulch	EO.014 Canyon Ferry	T11N R1W S14	Rocky scree, bluebunch wheatgrass, Dalmatian toadflax	Greater than 300	BC	New location, large population of Dalmatian toadflax
Spilling Gulch via Avalanche Gulch	EO.016 Hellgate	T11N R2E S30	Rocky scree, bluebunch wheatgrass	Approx. 50	B	New location, not large but robust and in a high quality location
Cave Gulch	EO.017 Canyon Ferry	T11N R1W S25	Rocky scree, Douglas-fir, rough fescue	Greater than 300	BC	New location, fire burned intensely in 2000. Dalmatian toadflax nearby

**Burnt Gulch, Pike Creek (EO.005):** All subpopulations that we revisited in this area appear to be healthy and unthreatened. This previously recorded population along F.S. road 138, east of Refrigerator Canyon and west of where Pike Creek crosses the road, is a very large colony. It occurs along the slope of the road-cut as well as on the shoulder of the road on both sides, and down the bank toward the creek. No noxious weeds were found at this site; however it is located on a well-traveled roadway and future invasion by noxious weeds is quite possible.

**Dry Creek (EO.006):** This is a previously documented occurrence along Dry Creek Road. The population was first noted on private land in Section 25 and consisted of a small population mixed in with many exotic species and subject to heavy grazing. This small population is at risk of being out-competed by weed species or trampled by cattle. A larger population in a somewhat less impacted habitat was noted in Section 30 in the NE ° of the NW ° Section. This population is in an area that burned in 2000 and was quite healthy in the low competitive environment. Noxious weeds



were not found right in the area, but common mullein (*Verbascum thapsus*) and cheatgrass (*Bromus tectorum*) were growing on or near the site. This additional subpopulation increases the overall quality of the occurrence.

**Dry Creek (EO.007):** This previously documented occurrence along Dry Creek Road was revisited in 2002. A separate occurrence was recorded in 2001 nearby and tentatively received a unique record number, EO.013. The land between the original location (EO.007) and the 2001 occurrence (EO.013) was surveyed in 2002 and additional plants were found scattered between these two points and on the surrounding slopes. It is, therefore, now considered one large population under the earlier occurrence record EO.007. This population is on steep, rocky scree that is difficult to traverse and appears to be secure at this time. Noxious weeds were not found at the site, though given the proximity to the road, future invasions are possible and should be monitored. The surrounding land provides abundant potential habitat for *Polygonum douglasii* ssp. *austinae*.

**Indian Flats (EO.015):** We marked a small population of *Polygonum douglasii* ssp. *austinae* along F.S. road 138 at Indian Flats. This population is less than 40 individuals and the site is not considered high quality. The habitat is not extensive and the rocky road bank quickly gives way to a flat, well-vegetated grassland community. This site is shared with several scattered plants of *Cirsium longistylum*. Cows had trampled the ground around these plants, and while no noxious weeds were present at the site, the road could easily provide a vector for noxious weeds to invade the area.

**Kingsberry Gulch (EO.014):** We discovered another population of *Polygonum douglasii* ssp. *austinae* in Kingsberry Gulch. This site is located just west of F.S. road 4136 A3 on a southeast-facing slope. This grassland site burned in the summer of 2000 with a fire of intensity sufficient to kill scattered trees. This population is healthy and reproducing well in its habitat, but it is located in the

middle of a very large Dalmatian toadflax (*Linaria dalmatica*) patch, making it quite vulnerable to herbicide spray. During a broad search of the surrounding area, we observed many potential habitats, but did not find *Polygonum douglasii* ssp. *austinae* anywhere else. This population is one of the few observed that is not along a roadside, and will be harder to relocate and mark for weed treatment crews. This general area is likely to support other populations of *Polygonum douglasii* ssp. *austinae*.

**Spilling Gulch (EO.016):** We noted another population of *Polygonum douglasii* ssp. *austinae* located by traveling up Avalanche Gulch to Spilling Gulch, then approximately .3 mile north up Spilling Gulch. This population is on a steep southwest-facing slope. The plants are healthy and quite robust. The population is not large and there is only one small subpopulation 100 yards to the north. No noxious weeds are in the near vicinity, however numerous weeds are thriving in the area. Musk thistle (*Carduus nutans*), and houndís-tongue (*Cynoglossum officinale*) are found at the base of the scree slope. The coarse scree slope that supports *Polygonum douglasii* ssp. *austinae* would most likely not be suitable habitat for musk thistle or houndís-tongue. This site could be vulnerable to an invasion by Dalmatian toadflax or spotted knapweed (*Centaurea maculosa*), which is found in many locations along Avalanche Gulch and its side drainages, but was not noted in Spilling Gulch.

**Cave Gulch (EO. 017):** This population of *Polygonum douglasii* ssp. *austinae* is located up Cave Gulch just below a ridge and above an old trail. It is on a moderately steep south- to southwest-facing slope. This forest site burned in the summer of 2000 with a fire of intensity sufficient to kill all the trees. This population is not large but appears to be healthy and reproducing well. It is located close to a Dalmatian toadflax patch, making it quite vulnerable to herbicide spray. The competing vegetative cover is low, as is the canopy cover, both due in part to the 2000 fires. With Dalmatian toadflax thriving nearby, the threat of weed infestation is quite strong.

## ***Cirsium longistylum* (long-styled thistle)**

We found *Cirsium longistylum* in fourteen locations; eleven were new locations and three were previously recorded sites that we revisited. Table 2 provides an overview of the location, habitat, population size and comments about each *Cirsium longistylum* occurrence.

**Table 2: Occurrences of *Cirsium longistylum***

<b>Drainage Location</b>	<b>Occurrence # Quad</b>	<b>T/R/Section</b>	<b>Habitat/Veg.</b>	<b>Size of Population</b>	<b>EO Quality</b>	<b>Comments</b>
Gipsy Creek	EO.006 Gipsy Lake	T9N R4E S27, 28, 30, 31, 32, 33	Grassland roadsides	1000-5000, approx. six mile strip	BC	Site revisited, well established
Thompson Gulch	EO.044 Gipsy Lake	T9N R4E S27	Mixed grassland and conifer woodland	Five in 100 square feet area	CD	An isolated population in an area known to have a large population
Gipsy Creek	EO.046 Gipsy Lake	T9N R4E S34	Open mixed grasslands	15-25 in 100 square yards	C	Small population in a weedy site
Road 4118	EO.045 Snedaker Basin	T12N R1E S9	Rough fescue grassland	50-75 in a .5 mile strip	B	Modest number but in a high quality habitat
Indian Flats	EO.047 Hogback	T13N R1W S36; T12N R1W S1	Disturbed grassland	35-50, in a two mile strip	C	Modest number along disturbed roadside habitat
Pike Creek	EO.048 Hogback	T13N R1E S30	Disturbed forest opening, roadside	16 total, 200 square feet	CD	In a logged opening with many weeds
Road 425 G1 Spring Creek area	EO.049 Hellgate	T11N R1E S2	Disturbed roadside	5-10, 100 square feet	D	Along weedy roadside
Nary Time Gulch	EO.050 Whites City	T11N R2E S9	Disturbed grassland	40-75, .5 mile strip	BC	Both sides of creek and along roadside, weedy
White Gulch	EO.051 Whites City	T10N R2E S1, 12, 14	Disturbed creek bottom, grassland	50-100, 1.5 mile strip	BC	In vegetated dry creek and along closed road
Cement Gulch	EO.024 Whites City	T10N R3E S7, 8, 18, 17	Grassland-shrub riparian area	25-50, 1.5 mile strip	BC	Revisited site along creek in mixed grasses, forbs and shrubs
Ohio Gulch, Benton Gulch	EO.052 Whites City and Watson	T11N R3E S28, 33, 32; T10N R3E S5	Grassland-shrub riparian area	75-200, three mile strip	B	Along creek in mixed grasses, forbs and shrubs
Road 4161	EO.030 Whites City	T11N R2E S26, 25, 36; T11N R3E S 31; T10N R2E S1	Open mixed grassland, rough fescue-Idaho fescue	Approx. 500, four mile strip	AB	Revisited site of good quality grassland, not too weedy
Hellgate Gulch	EO.053 Hellgate	T11N R1E S27	Weedy, burned creek side	Two individuals	D	Very weedy, disturbed habitat
Elk Ridge	EO.054 B.K Ranch, Snedaker Basin	T13N R1E S 15, 14	Open mixed grassland, rough fescue-Idaho fescue	Greater than. 300 individuals	AB	Good native grassland, some grazing, few weeds

**Gipsy Creek (EO.006):** Toward the southern part of the survey area, we revisited one site along Duck Creek Road near Gipsy Lake. This location was first documented in 1976, and represents a very large population that is mainly found in the grasslands between the road and the forest. It covers a linear strip that extends over 6 miles. In 2001, the population was observed to be widespread along the road corridor and appeared healthy and widely diffused. Two noxious weeds, Canada thistle (*Cirsium arvense*) and common tansy (*Tanacetum vulgare*) are found in the same habitat. *Cirsium longistylum* bears a resemblance to *C. arvense* and can be mistaken for that noxious weed.

**Thompson Gulch (EO.044):** In the same general area, we located a new population of *Cirsium longistylum* southwest of the Thompson Gulch Ranger Station and about one mile north of Gipsy Lake. This is a small population of approximately five individuals located in a grassy meadow a good distance from the road. Canada thistle is also found at this site. Insect larvae were found in the seed heads of several plants that we inspected. This could be the result of a biological control agent, used to help control musk thistle, which has spread to native thistles. This phenomenon was also noted in a 1993 report by MTNHP (Poole & Heidel) for the Helena National Forest. The impact of biological control agents infesting populations of native *Cirsium* is not fully understood.

**Gipsy Creek (EO.046):** We discovered another population of *Cirsium longistylum* between Duck Creek Road and Gipsy Lake in an open, grassy meadow. This population is comprised of approximately 15 to 25 individuals and is interspersed with musk thistle, Canada thistle, bull thistle (*Cirsium vulgare*) and hound's-tongue. This site is highly disturbed and this population is certainly vulnerable to herbicide spraying. Insect larvae were also found in the seed heads of this population.

**Road 4118 (EO.045):** We located one population of *Cirsium longistylum* in the far north of the Big

Belt survey area. The location can be reached by going through Indian Flats on F.S. road 138, then east on 4118 past the private land in Section 4. This healthy population is located in a high quality, rough fescue grassland adjacent to the roadway. It contains more than 50 plants and numerous rosettes are present, indicating good reproduction. No noxious weeds are evident at this location, though large numbers of musk thistle and Canada thistle are found along the roadway in both directions, and could certainly move into this grassland. This occurrence is not a large population but is found in a high quality habitat that supports a healthy native plant community.

**Indian Flats (EO.047):** Along F.S. road 138, we noted another population on the road shoulder in the Indian Flats area. This area is more disturbed, mainly by cattle grazing. Plants are widely scattered for approximately 2 miles along the roadway in a linear strip. The quality of this occurrence is not considered high, but some rosettes are present and the population looks well established. No noxious weeds are present, though musk thistle is found in the area and could possibly move into this site.

**Pike Creek (EO.048):** Along F.S. road 138 we recorded another occurrence of *Cirsium longistylum*. It is found at a location distinct from the population around Indian Flats, but could certainly be considered a subpopulation. This site has six flowering plants and ten rosettes. They are found along the road in an area disturbed by logging activity. This occurrence is considered to be of lower quality. Musk thistle and Canada thistle are also present at this location. Much of this higher elevation road corridor should be considered potential habitat for this species, and scattered individual plants can be expected.

**Spring Creek Area (EO.049):** We discovered a population of *Cirsium longistylum* off the upper part of Magpie Creek Road, located in the northern part of the Hellgate Quad along road 425 G1. This small population contains less than ten plants and is mixed in with musk thistle and Canada thistle along the shoulder of the road. A light burn from the



summer of 2000 is in evidence. This population of *Cirsium longistylum* had been sprayed with herbicide recently enough that the blue dye was still quite apparent. The meadow below this roadside population was explored and no other plants were observed. Further survey work in this area is warranted.

**Nary Time Gulch (EO.050):** Toward the upper end of Avalanche Gulch we marked an occurrence of *Cirsium longistylum* along Nary Time Gulch. This population is comprised of approximately 40 to 75 individuals and some rosettes, and is located on either side of the creek, as well as along the roadway. Musk thistle and houndís-tongue are also present at this location. The vegetation along this drainage is certainly influenced by cattle grazing. This population extends for about .5 mile along the Nary Time Road and appears to be secure. One plant occurs along Avalanche Creek approximately .75 of a mile down stream from where Nary Time Creek flows into Avalanche Creek, and occupies a very weedy site. We considered it to be part of the larger population along Nary Time. The upper portion of Avalanche Creek near Nary Time could quite likely support additional plants now or in the future.

**White Gulch (EO.051):** Up F.S. road 587, past Whites City and north along White Gulch, another occurrence for *Cirsium longistylum* was marked. This population is comprised of between 50 and 100 individuals with some rosettes, and is scattered for approximately 1.5 to 2 miles along the road and in the dry creek bed. It is secure and should be considered of moderate quality. Timothy (*Phleum pratense*) and musk thistle, along with bull thistle and houndís-tongue, dominate the vegetation. The threat to this population is, once again, herbicide spraying. The left-hand fork near the top of White Gulch was not surveyed, but should be considered potential habitat.

**Cement Gulch (EO.024):** A *Cirsium longistylum* occurrence was confirmed on F.S. road 287, along Cement Gulch. This population is scattered along the creek bottom, well off the road

and is found for over 1.5 miles. Rosettes are present and the population appears to be well dispersed. Many of the seed heads were black and not fully formed. This is the only location where that condition was observed. Lots of noxious weeds including musk thistle, Canada thistle, houndís-tongue, and spotted knapweed, were found mixed in with these plants. A previous occurrence record identified plants along the road corridor. We observed no plants in that habitat during 2001 fieldwork, however the population in the creek bottom was not previously recorded and extends the occurrence to include a more natural habitat.

**Ohio Gulch, Benton Gulch (EO.052):** Farther up the road, Cement Gulch merges into Benton Gulch, and then Ohio Gulch veers off in a southwesterly direction. About .5 mile up Ohio Gulch we marked another population of *Cirsium longistylum*. This population is well established and scattered along the Ohio Gulch drainage, which flows into Benton Gulch. It extends north along Benton Gulch and was recorded to a point just before the confluence of Benton Gulch and Horse Gulch. This widely diffused population is found mostly in the dry creek bottoms, with a few individuals along the road shoulders. Musk thistle, Canada thistle and houndís-tongue are found at various points growing with *Cirsium longistylum*. This population extends for approximately 3 miles, and though the number of individuals is not large, numerous rosettes are present and the population appears to be well established and healthy. The full length of Ohio Gulch was not surveyed, but the occurrence is expected to continue southeast up the drainage.

**Road 4161 (EO.030):** On F.S. road 287, where Cement Gulch joins Benton Gulch, Hour Gulch heads off to the southwest. Hour Gulch intersects F.S. road 4161 and a population of *Cirsium longistylum* is found intermittently for approximately 4 miles beside road 4161 and in the grassland meadows along the ridge paralleling the road. These plants are mixed in with other native thistles. This ridge is apparently grazed by sheep,

but for the most part appeared to be in a healthy condition. Noxious weeds were found occasionally, but rarely in abundance. Musk thistle, houndis-tongue, and spotted knapweed were all noted. This survey confirmed and expanded our record for this healthy population. Additional potential habitat exists along the road and the ridge in this area.

**Hellgate Gulch (EO.053):** We discovered another occurrence up the Hellgate Gulch road, approximately 2.5 miles beyond the closure established by the Forest Service after the fires of 2000. This population consisted of only one plant and what is most likely one rosette. Much of this area is heavily infested with musk thistle and if there is a more extensive population of *Cirsium longistylum*, it was very difficult to find. The single plant was in an area that burned during the fires of 2000, which may have diminished a larger population. Given that at least one plant survived, there is a chance that more could become established in future years. Other disturbances such as cattle grazing and mining activity were observed along the creek. We surveyed the drainage for another .5 mile past the above occurrence and no additional plants were found; however potential habitat continues up the drainage.

**Elk Ridge (EO.054):** Off Forest Service road 138, 1.5-2 miles north of Indian Flats, a road heads east to Elk Ridge above Jim Ball Basin, where we located a population of *Cirsium longistylum*. It is fairly substantial, consisting of over 300 plants, and is mostly within a healthy grassland community. This rough fescue grassland has a high number of native plants and few exotic species. Numerous

rosettes were mixed in with the flowering plants. Exotic thistles, in particular musk thistle and Canada thistle, are scattered along the road in the vicinity. A few *Cirsium longistylum* were found along the road mixed in with these weeds, but most of the population was in the native grassland. This area is a high ridge and is of mixed ownership, with some Forest Service land and a high percentage of private land. Cattle were grazing during the time the survey was conducted. This is also a block management area for big game hunting. The grassland is quite extensive and more individuals and subpopulations can be expected, mainly on the private land. This population is both large and is located in a high quality native habitat, making it the highest quality occurrence visited for this species.

**Occurrences Not Relocated:** In addition, two sites were revisited and the populations could not be relocated. One of these was at Carl Creek, about 20 miles east of the city of Townsend, just south of Highway 12. No plants were found at this site and the area showed signs of heavy grazing pressure. This site was considered to be of low quality when it was originally surveyed, based on the small size of the population and evidence of disturbance. The original occurrence record noted the presence of weevils in these plants. The second site we were unable to relocate was at the junction of Confederate Gulch and Cement Gulch. *Cirsium longistylum* was not found at this site, nor was it sighted along the roadway above Cement Gulch where it had previously been found. However, there was a viable population along the creek that appeared to be secure, discussed above.

## ***Phlox kelseyi* var. *missoulensis* (Missoula phlox)**

*Phlox kelseyi* var. *missoulensis* was recorded at three locations. One site on MacDonald Pass around the radio towers has been variously documented over the years. Another location about one mile east of Mullan Pass, near the road to Austin, was close enough to a previously documented population to consider it either a subpopulation or an extension of the existing population. A third population was located on Elk Ridge above Jim Ball Basin and is a new occurrence. Table 3 provides an overview of the location, habitat, population size and brief comments about each *Phlox kelseyi* var. *missoulensis* occurrence.

**Table 3: Occurrences of *Phlox kelseyi* var. *missoulensis***

Drainage Location	Occurrence # Quad	T/R/Section	Habitat/Veg.	Size of Population	EO Quality	Comments
MacDonald Pass	EO.004 MacDonald Pass	T9N R6E S2	Mixed grassland and bare ground on ridge top	100 to several hundred	BC	Healthy site with lots of native vegetation
Mullan Pass	EO.014 Greenhorn Mt.	T10N R6W S1	Open limestone slope with limber pine and juniper	Over 500 clumps	AB	Healthy site with few weeds mixed in
Elk Ridge	EO.016 B.K Ranch, Snedaker Basin	T13N R1E S 15, 14	Open mixed grassland, rough fescue-Idaho fescue	Greater than 300 individuals	BC	Good native grassland, some grazing, few weeds

**MacDonald Pass (EO.004):** This area has had various and somewhat conflicting surveys done in the past. The entire top of the grassy meadow by the radio towers, and around the parking area, is full of *Phlox* species. Some species of this genus can be quite difficult to separate from other closely related species. In particular, *Phlox kelseyi* and *Phlox pulvinata* share many similar floral and vegetative characteristics. To determine which *Phlox* species are actually present, specimens were obtained from several of the larger plants and taken to the MONTU Herbarium to compare with previous collections. Several collections of *Phlox kelseyi* var. *missoulensis* from MacDonald Pass were already in the herbarium. Most of our collections from MacDonald Pass fit the characteristics of *P. pulvinata*. Some of the plants, especially those around the radio towers, display characteristics consistent with *Phlox kelseyi* var. *missoulensis*. We concluded that the greater part of the white flowering phlox in this meadow is *P. pulvinata*. *Phlox kelseyi* var. *missoulensis* is concentrated close to the radio towers and the surrounding meadows. For the purpose of weed treatment, most of the weedy species are located close to the roadways and most of the *Phlox*

*kelseyi* var. *missoulensis* is within the grasslands. Spot spraying would greatly reduce the risk to these plants from overspray.

**Mullan Pass (EO.014):** About a mile east of Mullan Pass, on road 1805, there was a recorded population of *Phlox kelseyi* var. *missoulensis* upslope (north) above the train tracks. A few plants had been noted just around the tracks (to the south), and in 2002 a much larger population was found growing on the limestone slope to the west. It consists of over 500 clumps, well dispersed, growing around and under limber pine (*Pinus flexilis*) and bear-berry (*Arctostaphylos uva-ursi*). Spotted knapweed and Dalmatian toadflax become common to dominant near the train tracks. *Phlox* plants from this population were compared to specimens in the MONTU Herbarium and are among the largest in size of any *Phlox kelseyi* var. *missoulensis* collections there. They could not easily be confused with *P. pulvinata*. This population is bordered by private land to the west. The bulk of the population is located approximately .25 mile upslope from the tracks and should not be affected by herbicide spray that is focused on the area near the tracks. However, some individuals

are located adjacent to the train tracks and may be subject to herbicide spray. Care should be taken to avoid these plants if possible.

**Elk Ridge (EO.016):** Off Forest Service road 138, 1.5-2 miles north of Indian Flats, a road heads east to Elk Ridge above Jim Ball Basin. This is a high meadow with mixed grasslands and rock outcrops. A population of *Phlox kelseyi* var. *missoulensis* was noted here. This population is a mixed *Phlox* community, similar to that on MacDonald Pass, with *P. hoodii*, *P. multiflora*, *P.*

*pulvinata* and *Phlox kelseyi* var. *missoulensis* growing within the same meadow. These plants also show some intermediate forms, indicating possible hybridization that further complicates the picture. However, some plants we collected had morphological features consistent with *Phlox kelseyi* var. *missoulensis*. Population size is difficult to estimate, but could be over 100 individuals. Musk thistle and Canada thistle were uncommon along the road and other exotic species were few. Weeds should be easy to target without overspraying onto these plants.

### ***Draba densifolia* (dense-leaf draba)**

*Draba densifolia* was found at two new locations in 2002. This species is not currently considered a USFS Sensitive Species and therefore was not modeled for potential habitat during the initial stage of our project. The Montana Natural Heritage Program considers *Draba densifolia* a Species of Concern, with a state rank of S2. Table 4 provides an overview of the location, habitat, population size and comments about each *Draba densifolia* occurrence.

**Table 4: Occurrences of *Draba densifolia***

Drainage Location	Occurrence # Quad	T/R/Section	Habitat/Veg.	Size of Population	EO Quality	Comments
MacDonald Pass	EO.017 MacDonald Pass	T9N R6E S2	Rocky soil w/ mixed forbes & graminoids	50 to 75 individuals	BC	Healthy site with lots of native vegetation
Spotted Dog Creek	EO.016 Baggs Creek	T7N R7W S7	Open rocky soil with little competing veg.	75 to 100 individuals	B	Healthy site with no weeds mixed in

**MacDonald Pass (EO.017):** About 12 miles west of Helena to the south of Highway 12 at MacDonald Pass, a population of *Draba densifolia* was located to the northeast side of the radio towers. These plants were found in the rocks and comprise a moderate to small population of fewer than 75 individual plants. The habitat is good, with little competing vegetation, and is surrounded by grasslands with many forbs. This site may be subject to disturbance from trampling and servicing the radio towers. Two weeds, musk thistle and Canada thistle, were along the roadway approximately 90 feet distant. If these weeds are treated with herbicide, care should be taken to contain the overspray.

**Spotted Dog Creek (EO.016):** This population is located about 8 miles southwest of Elliston. Take Forest Service road 314 until it ends at the locked gate. The population is about 1 mile west of Spotted Dog Creek on a ridge. These plants were found on the sparsely vegetated slope of a stony knob, and numbered 75 to 100 individuals. Grasslands surround this site and cattle were seen grazing during the time of the survey. No weeds were adjacent to this occurrence, but some large populations of musk thistle and Canada thistle were observed nearby. Weed treatment should pose no danger unless aerial spraying was to take place.

## ***Astragalus convallarius* var. *convallarius* (lesser rushy milkvetch)**

*Astragalus convallarius* var. *convallarius* was found at one site in 2002. This plant is not currently considered a USFS Sensitive Species and therefore was not modeled for potential habitat during the initial stage of our project. *Astragalus convallarius* var. *convallarius* is tracked as a Species of Concern by the Montana Natural Heritage Program and has a state rank of S2. Table 5 provides an overview of the location, habitat, population size and comments about this *Astragalus convallarius* var. *convallarius* occurrence.

**Table 5: Occurrences of *Astragalus convallarius* var. *convallarius***

Drainage Location	Occurrence # Quad	T/R/Section	Habitat/Veg.	Size of Population	EO Quality	Comments
Oregon Gulch	EO.011 Canyon Ferry	T11N 1W S27	Northwest facing, rough fescue grassland	Less than 50 individuals	C	Healthy site with lots of native vegetation, many weeds nearby

**Oregon Gulch (EO.011):** *Astragalus convallarius* var. *convallarius* was found on a grassy slope above a seasonally dry creek, one drainage to the east of Oregon Gulch. This well vegetated meadow was unusual in an otherwise sparsely vegetated landscape. The population is

small but healthy, with scattered individuals found throughout the meadow. Large populations of Dalmatian toadflax and spotted knapweed are close by, and over time will pose a threat to the plant community that supports this population.

## ***Botrychium paradoxum* (peculiar moonwort)**

This species was surveyed late in the season during 2001, and again in 2002 during the optimal growing season. No new populations were found. Forest Service employees found two populations in the Helena National Forest during 2001. We revisited one of these sites and found a single plant. Table 6 provides an overview of the location, habitat, population size and comments about each *Botrychium paradoxum* occurrence. These two occurrences represent the only documented locations on the Helena National Forest.

**Table 6: Occurrences of *Botrychium paradoxum***

Drainage Location	Occurrence # Quad	T/R/Section	Habitat/Veg.	Size of Population	EO Quality	Comments
Irish Mine	EO.021 Basin NW	T8N R7W S9	Rough fescue grassland	63 individuals	B	Good native grassland, cattle grazing
Occidental Plateau	EO.022 Mt. Thompson	T7N R5W S26	Rough fescue grassland	Less than 20 individuals	BC	Good native grassland, lots of plant litter

**Irish Mine (EO.021):** This site is located about 6 miles southwest of Elliston on Forest Service road 1870, in a healthy rough fescue grassland. This land is part of a grazing unit and the plants were observed prior to grazing activity in 2001. In 2002 this location was revisited and only 1 plant could be relocated. Grazing was already occurring at the time of the revisit.

**Occidental Plateau (EO. 022):** This site is located about 10 miles southwest of Helena east of the Occidental Plateau road, just within the Helena National Forest boundary. This small population (less than 20 individuals) is within a native rough fescue/Idaho fescue grassland. The site was described as having no current disturbances and was not revisited during our surveys.



### ***Botrychium crenulatum* (wavy moonwort)**

*Botrychium crenulatum* was included in the search because an occurrence was reported on the Helena National Forest, but has not been confirmed. No populations of this species were observed during the fieldwork. *Botrychium crenulatum* is another small, fern-like plant normally found in moist riparian areas. Small individuals of the more common *B. lunaria* can resemble this species. This species is still unconfirmed for the Helena National Forest.

### ***Grindelia howellii* (Howell's gumweed)**

During the field season of 2001, we found no populations of *Grindelia howellii*. This was not unexpected, as there were no previous records of its occurrence within the Forest boundary. All known populations lie at lower elevations in the Blackfoot Valley northwest of Lincoln. No further surveys for this species were conducted during the 2002 field season.

## **DISCUSSION and RECOMMENDATIONS**

The areas surveyed during the field seasons of 2001 and 2002 were based on our potential habitat models (Weber & Crispin 2001). We found that some of the potential habitat identified by our modeling did not, upon field inspection, correspond with habitat for the targeted species. However, the majority of sites that were predicted by the analysis appeared to be appropriate habitat for the targeted species, allowing the botanist to focus search and travel time on appropriate locations.

Below is a discussion for each Sensitive Species with some field observations on habitat identification and possible strategies to avoid conflicts between weed treatments and these Sensitive Species.

### ***Polygonum douglasii* ssp. *austinae***

*Polygonum douglasii* ssp. *austinae* is typically found in xeric sites on very coarse, rocky scree. The vegetation is generally sparse with bluebunch wheatgrass (*Elymus spicatus*) the most common associate. Weeds were not normally found within populations of *Polygonum douglasii* ssp. *austinae*, with the notable exception of one site where Dalmatian toadflax was the dominant plant and threatens this Sensitive Species' habitat. That population (EO.014) poses a challenge for weed treatment. One possible approach is to treat the area with herbicide early in the spring, when Dalmatian toadflax first emerges and *Polygonum douglasii* ssp. *austinae* has not yet started to grow, using an herbicide that does not stay in the soil for long periods of time. A persistent chemical that remains in the soil could prevent *Polygonum douglasii* ssp. *austinae* from germinating later in the season.

Both Dalmatian toadflax and spotted knapweed have the ability to survive in very dry, rocky habitats and could potentially invade some of the occurrences of *Polygonum douglasii* ssp. *austinae*. This threat should be monitored. One location had been trampled by cattle, which damaged individual plants, but the site was unusual given that most of the other known locations are too steep and rocky to be utilized by cattle.

Potential habitat for *Polygonum douglasii* ssp. *austinae* is quite extensive in the Big Belt portion of the HNF. The coarse, rocky scree that appears to be the favored habitat is widespread. While many acres of land were surveyed for this plant, much more land was not surveyed. With the exception of the large Dalmatian toadflax infestation at the Kingsberry Gulch location, weeds did not seem to occupy the same niche as *Polygonum douglasii* ssp. *austinae*. However, Dalmatian toadflax and spotted knapweed seem to have the ecological amplitude necessary to move into these very rocky locations.

## ***Cirsium longistylum***

We found *Cirsium longistylum* in several different types of grassland habitats. Many locations are along, or in, creek bottoms. Some populations are along roadways and several populations are found in open, grassland meadows along crests or ridges. All populations were found above 5000 feet elevation and the majority above 6000 feet. These sites represent areas of moderate seasonal moisture, being neither very wet nor very dry. At the higher elevations, where snow may stay on the ground later in the year, the plants were found in otherwise dry meadows or along the shoulder of the road. When the plants were found at lower elevations, they were close to creeks or in seasonally dry creek beds. These locations were not moist at the time of the survey but would likely have more available moisture than the far drier surrounding uplands.

*Cirsium longistylum* is also found growing in a variety of disturbed settings. These disturbances include road corridors, cattle and sheep grazing, burned areas, ground squirrel activity, and logged areas. At two previously documented locations where we failed to relocate plants, the population had been small and disturbance great, according to the original records. All fourteen occurrences that we found were in the Big Belts. We surveyed many potential habitat polygons in the vicinity of the Little Blackfoot River south of Elliston, and in areas south of Helena, with no success. Some sites in the Elkhorns were also surveyed and while no *Cirsium longistylum* was found, some *Cirsium hookerianum* was observed. This native plant is very similar to *Cirsium longistylum* in stature, flower color and leaf characteristics. However, it lacks the expanded and dilated involucre.

Several noxious weeds are commonly found in association with *Cirsium longistylum*: musk thistle, Canada thistle, bull thistle and houndstongue. These weeds are aggressive and could, if unchecked, dominate large areas of land and potentially crowd out *Cirsium longistylum*. These noxious weeds, with the exception of houndstongue,

can be mistaken for *Cirsium longistylum* and vice versa. Herbicide spray may pose a serious threat to *Cirsium longistylum*, as it could be accidentally targeted for spraying along with the weeds, or be subject to overspray.

Native populations of *Cirsium longistylum* migrate over time as the old plants die out and the seeds, carried by wind, water or animals, are dispersed into new areas. Therefore, marking individual plants to avoid spraying would prove inadequate since plants are often widely scattered, and due to its short-lived perennial nature, there is a continuous process of older plants dying and new plants appearing. Also, marking the extent of a population would most certainly fail over time as these populations can expand and contract over many miles. That being said, once the general location of a known population is marked it will be easier, with a little education and caution, to avoid mistakenly spraying these plants.

During the field season of 2001, some *Cirsium longistylum* plants were observed to contain larvae in the seedheads. As noted earlier, the same phenomenon was documented in 1993. These larvae could be from a non-native biological control agent used to help control other weed species. If this is the case, the long-term ramifications are as yet unclear but could affect the viability of *Cirsium longistylum*.

## ***Phlox kelseyi* var. *missoulensis***

*Phlox kelseyi* var. *missoulensis* was documented at three different localities on the Helena National Forest. This species can be found from 3600 to 8250 feet, usually on gravelly, windswept ridges, although it is also known to occur in well-vegetated meadows. Two of these sites are in meadow habitats, at fairly high elevations on open ridges, and one is on a less vegetated, rocky spine.

In general, the species of this genus are quite difficult to separate. In particular, *Phlox kelseyi* var. *missoulensis* is very similar to several other *Phlox* species, including *P. kelseyi* var. *kelseyi*, *P.*

*multiflora*, and *P. pulvinata*. *Phlox kelseyi* var. *kelseyi* is found in moist alkaline meadows. *Phlox multiflora* is close in stature to the target species but lacks glandular hairs on the calyx and the leaves are finely scaberulous. *Phlox kelseyi* var. *missoulensis* often has glandular hairs on the calyx and is not scaberulous. *Phlox pulvinata* also has a very similar look and is common in the higher mountain meadows, however it is a somewhat smaller plant, mostly lying close to the ground, and has smaller leaves. These closely related species cannot always be well segregated by the experts working on this group, so it should be no surprise that it poses difficulties for others.

Weeds were not observed growing alongside *Phlox kelseyi* var. *missoulensis*, but were growing nearby along roads and in one instance, along train tracks. Weed control should keep weeds from infesting these sites. If chemical controls are used, limiting the overspray will reduce the threat to these populations.

### ***Draba densifolia***

*Draba densifolia* is found on high, dry, wind swept ridges in rocky soil with little competitive vegetation. Though these plants are considered globally secure (G5), the low number of individuals and the few populations reported in Montana has kept this as a Species of Concern with a state rank of S2. This plant is small and not very conspicuous. Key characteristics include the straight (not branched) hairs on the edges of the leaves and lack of hairs on the front surface of the leaves. Weeds were found along road corridors in close proximity to these populations, and at one site weeds were found in a grassy meadow with grazing disturbance. This site, EO.016, would be at risk from aerial spraying of herbicides.

### ***Astragalus convallarius* var. *convallarius***

*Astragalus convallarius* var. *convallarius* is found in mixed grasslands and shrublands in relatively dry landscapes. The narrow leaves and generally wispy nature of these plants can make it difficult to locate

in tall grasses. These same areas are being infested by Dalmatian toadflax and spotted knapweed, two weeds that can rapidly dominate these habitats and pose a potential threat to the viability of this population. Weed control could protect this site from noxious weed invasion.

### ***Botrychium paradoxum***

*Botrychium paradoxum* is an inconspicuous plant that has been found only rarely on the Helena National Forest. This could be due to unsuitable habitat or to the difficulty of locating individuals because the plants are very small and blend in with grasses. *Botrychiums* grow from underground roots and do not always send up leaves and sporophore when the conditions are not favorable (i.e. drought years). *Botrychium paradoxum* is found at elevations from 3500 to 8500 feet, but more often at the higher elevations. It is often in grass-dominated meadows associated with spruce and lodgepole pine forests. Fortunately, at the higher elevation habitats favored by these plants, weed problems are greatly diminished. The surveys for *Botrychiums* were focused in the areas close to mapped weed populations. Other potential habitats were observed and many of those were surveyed. These plants can easily be overlooked, due to their small size, and only very intense surveys can provide the opportunity to adequately cover these habitats.

### **General Observations and Conclusions**

During the course of our surveys we documented many instances of noxious weeds occupying the same habitats as targeted Sensitive plants. This is not surprising since a number of Sensitive plant species require open, successional habitats. Invasive weeds negatively impact the quality of these habitats and pose a threat to the long-term viability of some Sensitive Species. Survival for those plants may depend on implementing an effective weed treatment program, while at the same time, designing weed treatments in such a way as to minimize the direct negative impact to Sensitive Species populations.



Late in the 2001 field season, we encountered contracted weed spraying crews. Some areas that were surveyed for Sensitive plants had recently been sprayed for weeds. In one location above Magpie Creek (EO.049) *Cirsium longistylum* plants were sprayed along with noxious weeds on the roadside. This small population was surrounded by musk thistle, so it is not surprising that it was accidentally sprayed. In some areas we noted many native plants that had been selectively sprayed. Additional training for weed crews might reduce this accidental damage to native vegetation.

In many areas, hound's-tongue, musk thistle, and Canada thistle were sprayed long after mature seed heads had developed. It is quite likely those seeds will remain viable and spread to other locations via wind, or in the case of hound's-tongue, attached to animals, humans or vehicles. One possible way to deal with this problem is to spray early enough in the season to kill the plants before flowering and before the plants produce seeds. Another solution is to cut the seed heads from mature plants and bag them to prevent release from the mother plant, and then to spray the first year rosettes. Not as much ground could be covered using this technique, but it would be more effective. When time and money

are limited, one strategy may be to treat fewer drainages in a more thorough manner, or to work along the edges of weed populations to prevent the spread of existing populations to areas not currently infested. Native habitats with few noxious weeds, and especially those that contain Sensitive Species, should be protected from weed invasion. When Sensitive Species are located in the midst of noxious weeds targeted for spraying, supervision by a botanist or other highly trained personnel may be necessary if damage to Sensitive Species is to be avoided.

In general, specific weed treatments in areas with populations of Sensitive plants can be designed to reduce negative impacts to those species. If chemical herbicides are used, workers can take care to avoid overspray and can use spot spraying to specifically target weed species, when possible. It will be important to ensure that weed species are correctly identified, especially since *Cirsium longistylum* can be easily mistaken for other *Cirsiums* or *Carduus nutans* that may be targeted for weed treatment. If entire areas are to be treated, herbicide applications can be timed to minimize damage to Sensitive plant populations.

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# **Appendix A - Global/State Rank Definitions**

## **HERITAGE PROGRAM RANKS**

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status (Association for Biodiversity Information 2001). Species are assigned numeric ranks ranging from 1 (critically imperiled) to 5 (demonstrably secure), reflecting the relative degree to which they are “at-risk”. Rank definitions are given below. A number of factors are considered in assigning ranks -- the number, size and distribution of known “occurrences” or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species’ life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

## **RANK DEFINITIONS**

G1 S1	Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction.
G2 S2	Imperiled because of rarity and/or other factors making it vulnerable to extinction.
G3 S3	Vulnerable because of rarity or restricted range and/or other factors, even though it may be abundant at some of its locations.
G4 S4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery.
G5 S5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.
GU SU	Possibly imperiled, but status uncertain; more information needed.
GA SA	Native in nearby states, but in Montana believed to be accidentally introduced, deliberately planted, or escaped from plantings.
GH SH	Historical, known only from records over 50 year ago; may be rediscovered.
GX SX	Believed to be extinct; historical records only.

## **COMBINATION RANKS**

G#G# or S#S# Indicates a range of uncertainty about the rarity of the species.

## **SUBRANKS**

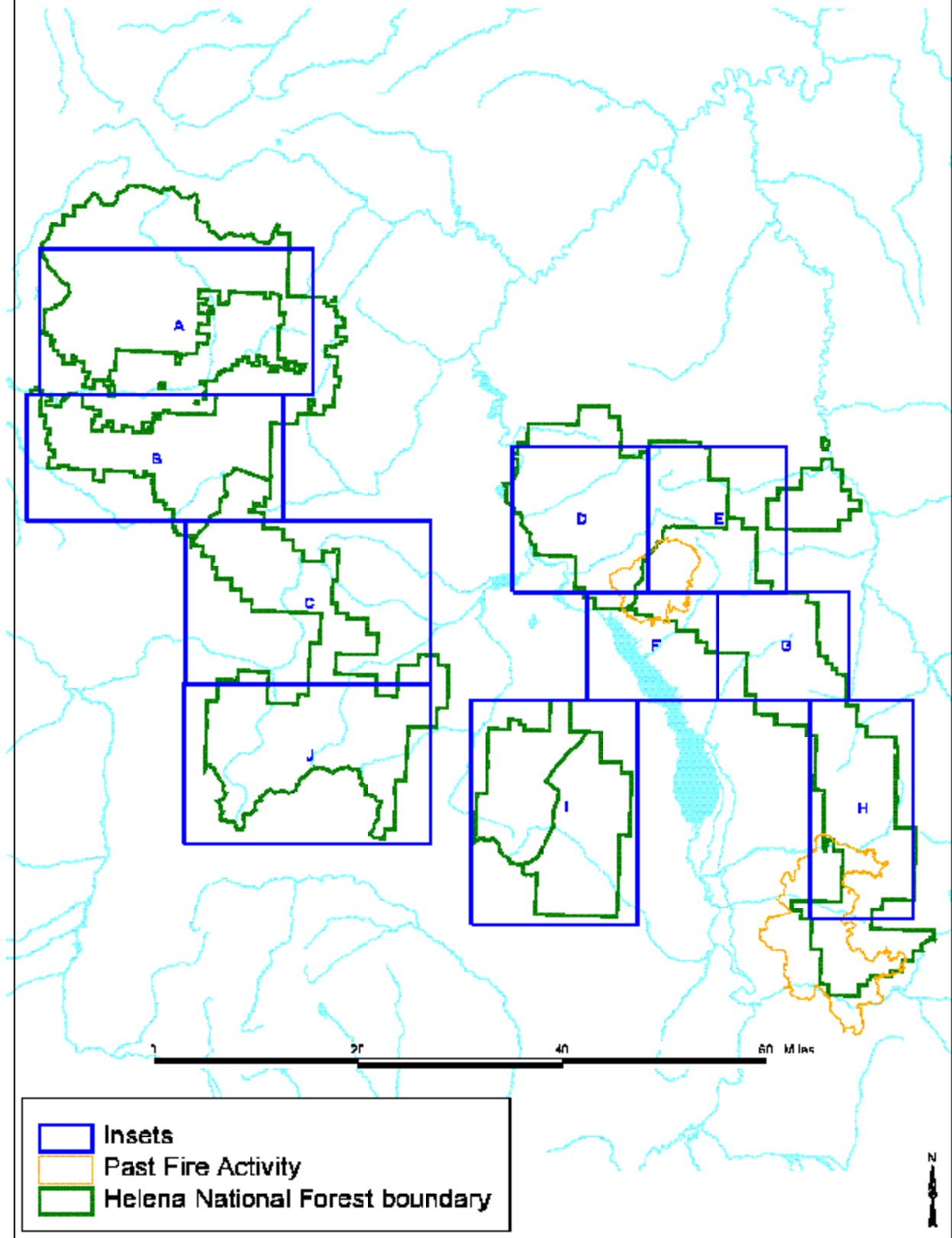
T#	Rank of a subspecies or variety; appended to the species’ global rank of the full species, e.g. G4T3.
----	-------------------------------------------------------------------------------------------------------

## **QUALIFIERS**

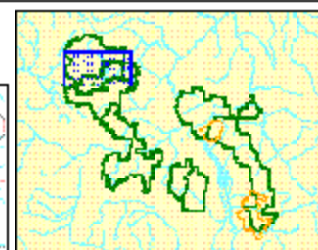
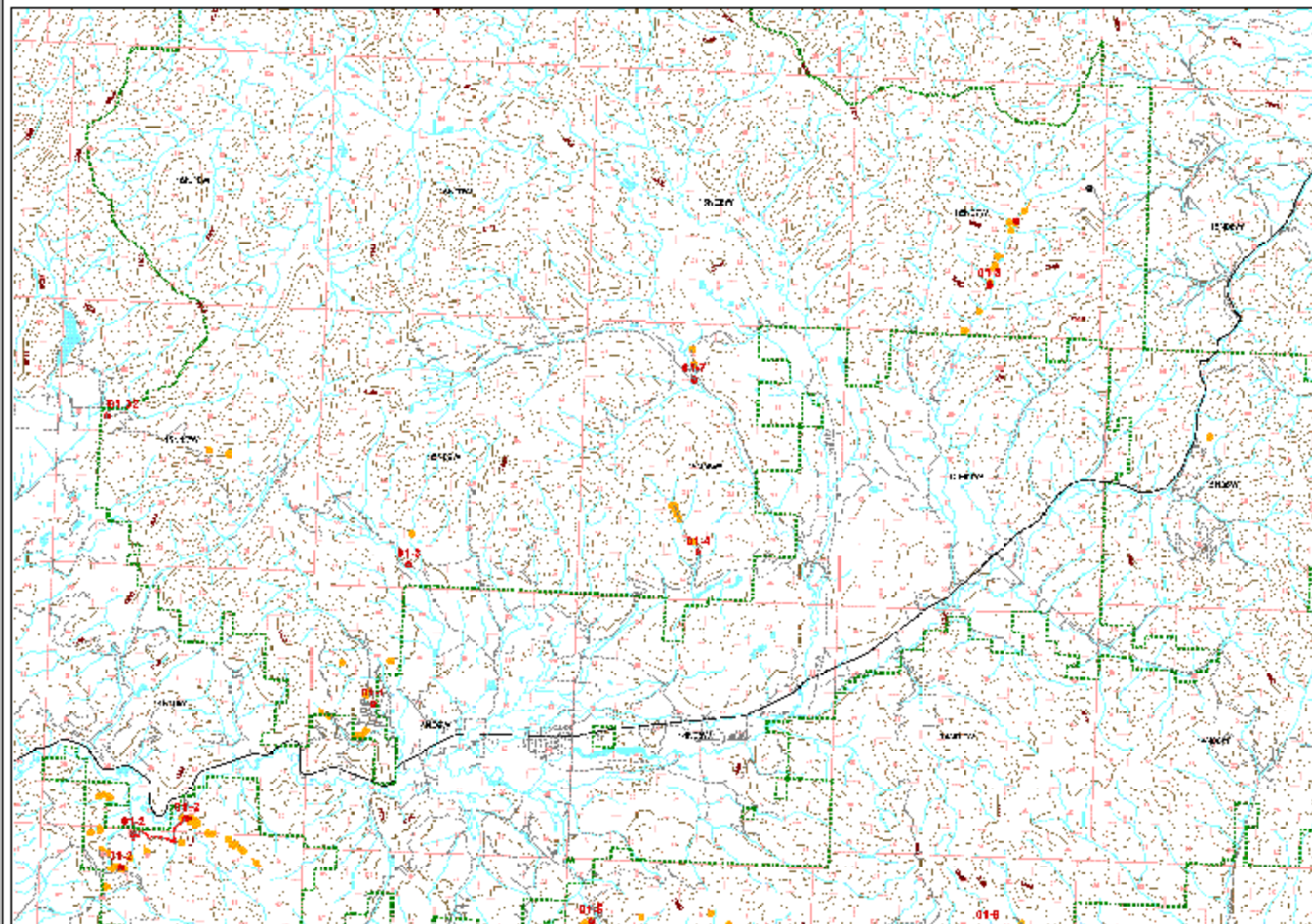
Q	Taxonomic questions or problems exist, more information needed; appended to the global rank, e.g. G3Q.
?	Denotes uncertainty or for numeric ranks, inexactness.

## **Appendix B - Maps of Area Surveyed**

## Helena National Forest - Inset Guide



# Inset A



This map illustrates the intersection of potential habitat and planned weed treatment areas, mapped by the USFS.

Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program databases, as of July 2007.

Elevation, slope, aspect, soil type, and vegetation at known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species

■ Helena National Forest

Road System

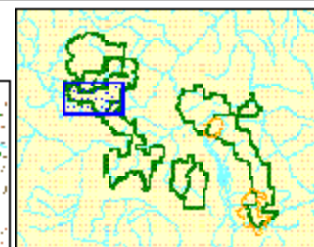
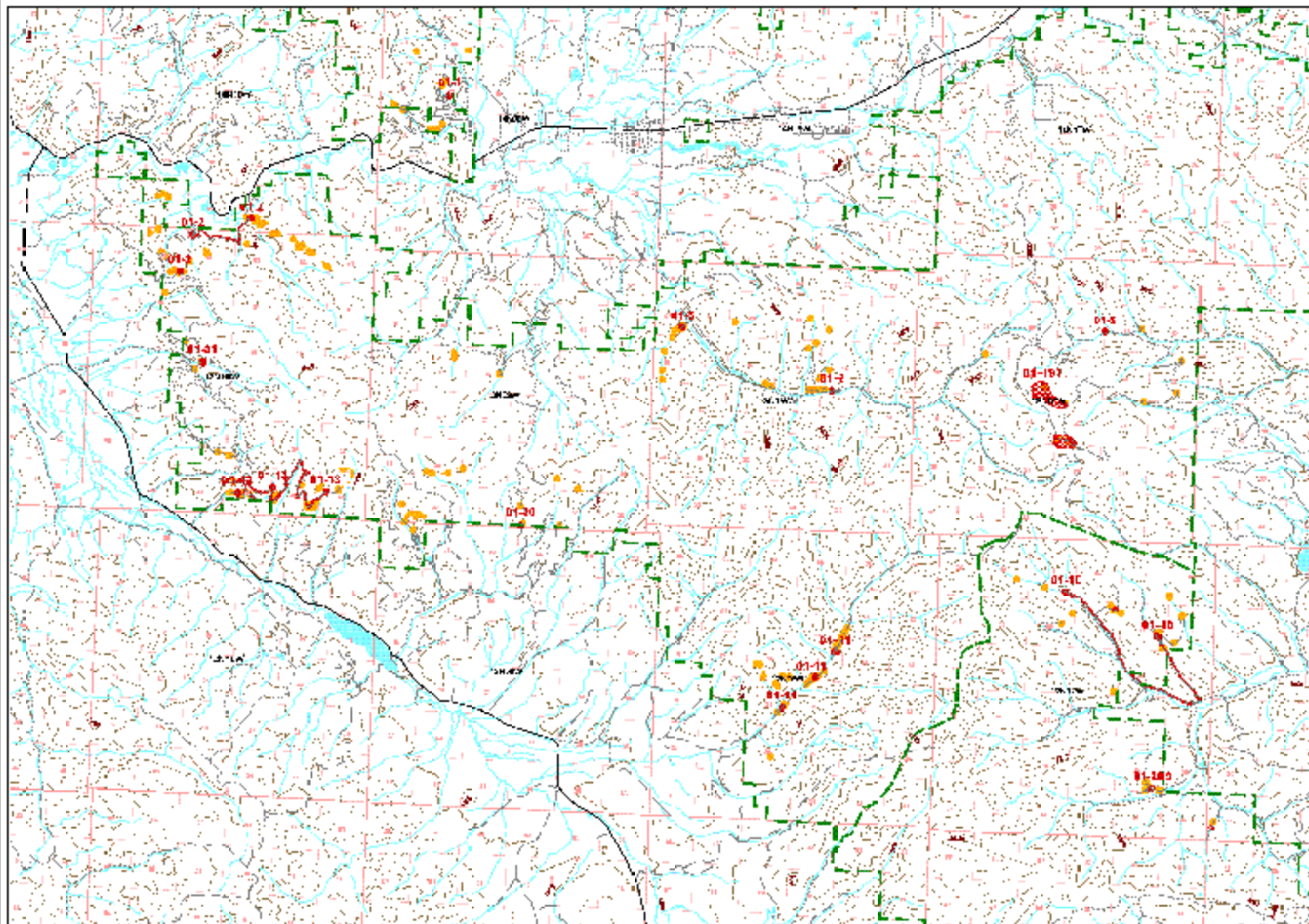
- Primary Road
- Secondary Road
- Local Road
- Other Roads
- Contours (m)

0 1 2 3 4 5 Miles



MT MONTANA  
Natural  
Heritage  
Program

## Inset B



This map illustrates the intersection of potential habitats, and paired weed treatment areas, mapped by the USFS.

Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program database, as of July 2001.

Elevation, slope, aspect, soil type and vegetation at known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Bunny Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species

■ Helena National Forest

- Road System
- Primary Road
- Secondary Road
- Local Road
- Other Roads
- Contours (m)

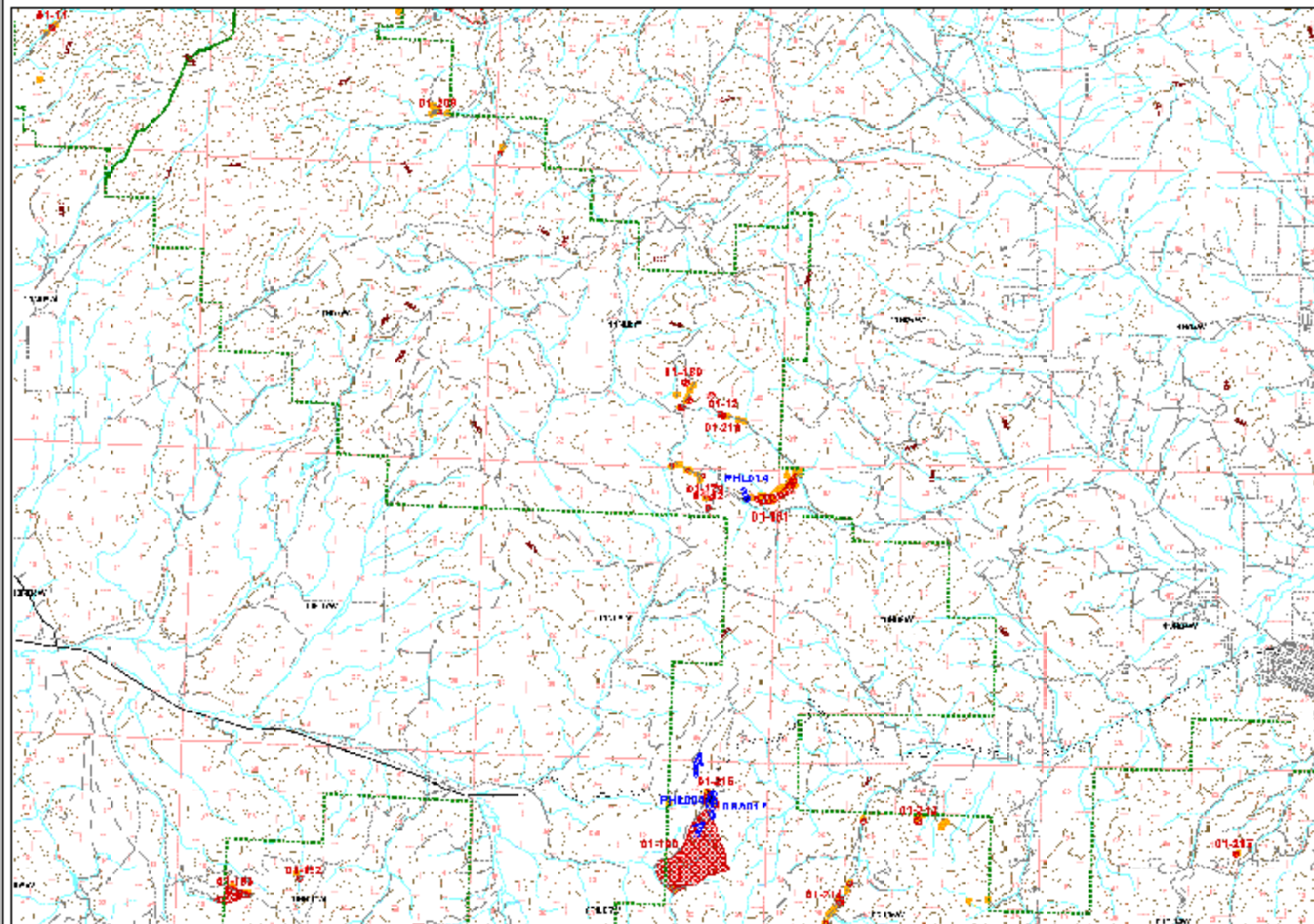
0 6 12 18 Miles



MONTANA  
Natural  
Heritage  
Program



## Inset C



This map illustrates the intersection of potential habitat and planned weed treatment areas, mapped by the USFS.

Areas of potential habitat were based on known locations of the target species, as distributed in the Montana Natural Heritage Program databases, as of July 2007.

Elevation, slope, aspect, soil type, and vegetation of known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species

Helena National Forest

Road System

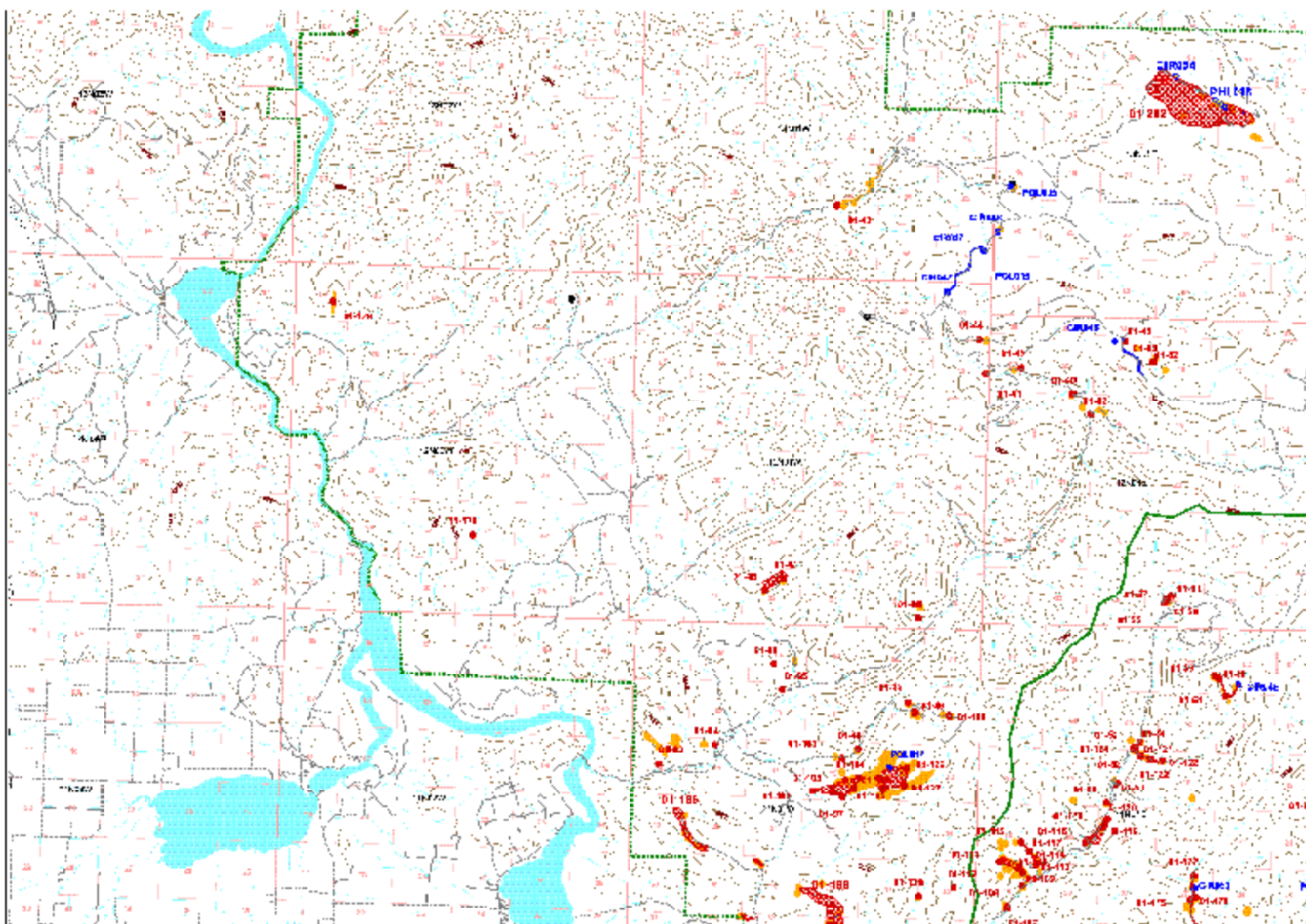
- Primary Road
- Secondary Road
- Local Road
- Other Roads
- Contours (m)

0 0.5 1 1.5 Miles



MT MONTANA  
Natural  
Heritage  
Program

## Inset D



This map illustrates the intersection of potential habitat and planned weed treatment areas, mapped by the USFS.

Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program database, as of July 2001.

Elevation, slope, aspect, soil type, and vegetation of known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species

Helena National Forest

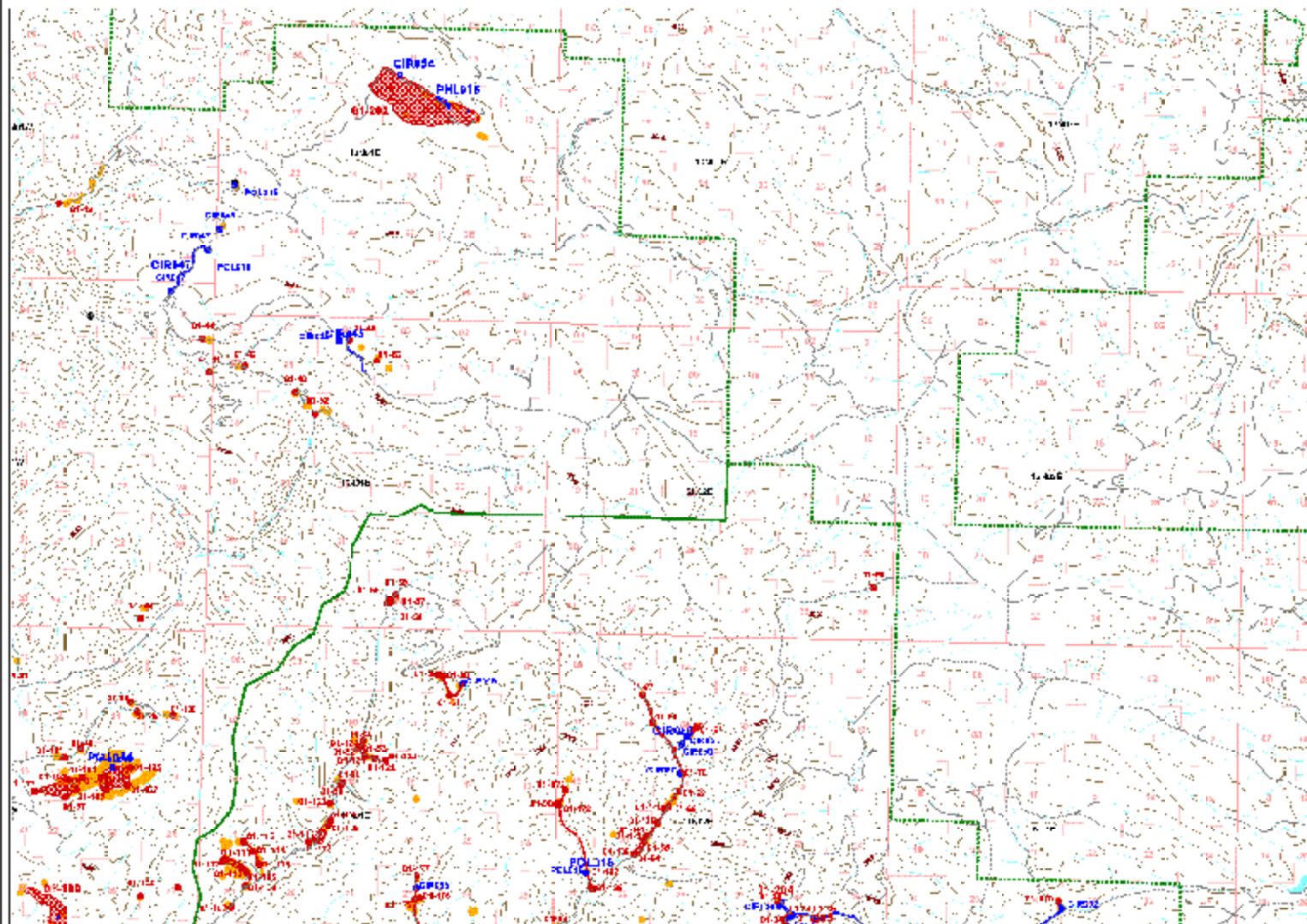
Road System

- Primary Road
- Secondary Road
- Local Road
- Other Roads
- Contours (m)

0 1/2 1 Mile



# Inset E



This map illustrates the intersection of potential habitat and planned weed treatment areas, mapped by the USFS.

Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program database, as of July 2001.

Elevation, slope, aspect, soil type, and vegetation at known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species
- Helena National Forest
- Road System
  - Primary Road
  - Secondary Road
  - Local Road
  - Other Roads
- Contours (m)

0 0.5 1 1.5 Miles










MONTANA  
Natural  
Heritage  
Program



Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program databases, as of July 2001.

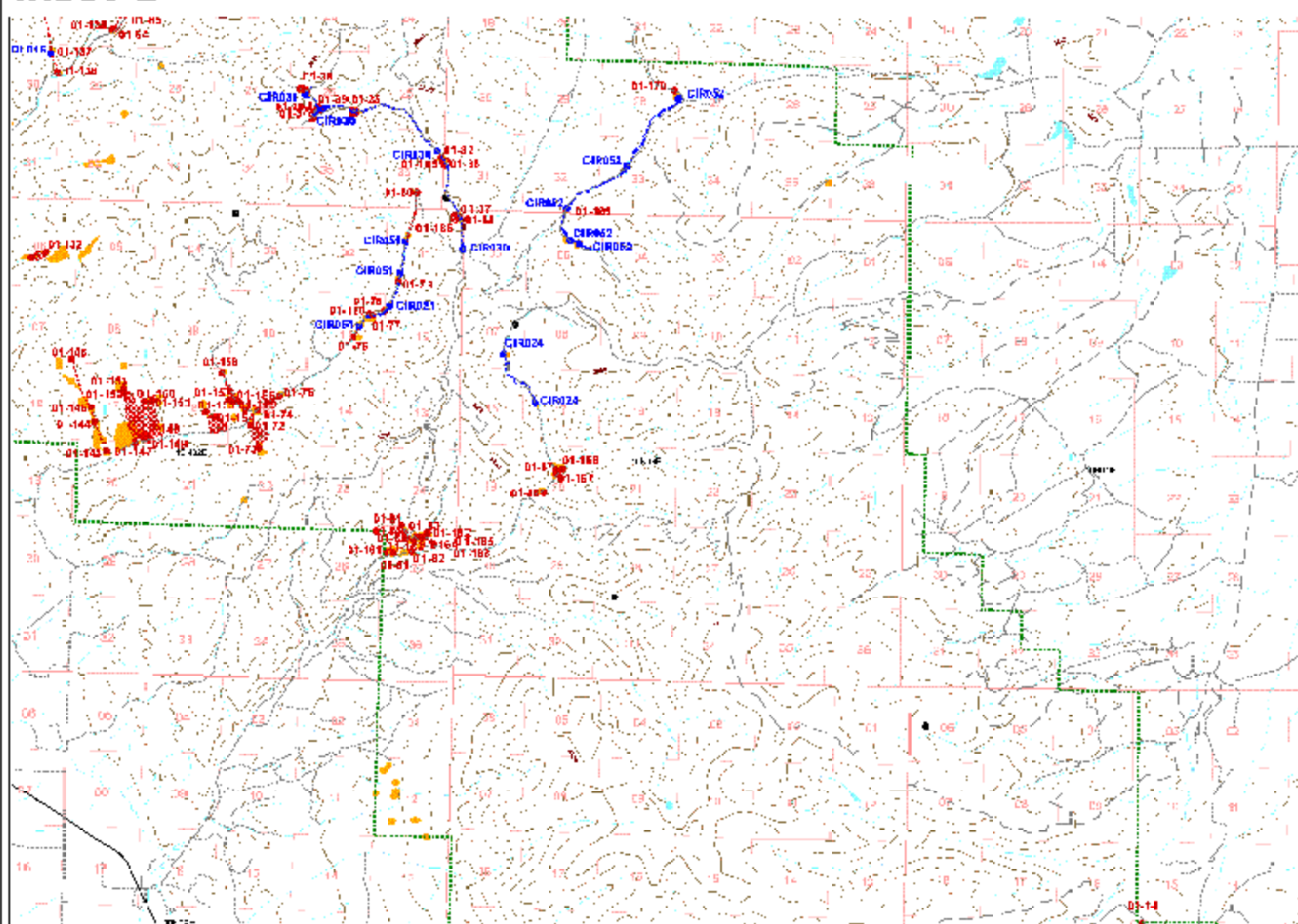
Elevation, slope, aspect, soil type and vegetation at known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Bunny Locations
- Previously Known Species Locations
- Wetland Treatment Area in Potential Habitat for Target Species

-  Helena National Forest  
 Road System  
 Primary Road  
 Boundary Road  
 Local Road  
 Other Roads  
 Contours (m)



# Inset G



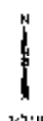
This map illustrates the intersection of potential habitat and planned weed treatment areas, mapped by the US-B.

Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program database, as of July 2001.

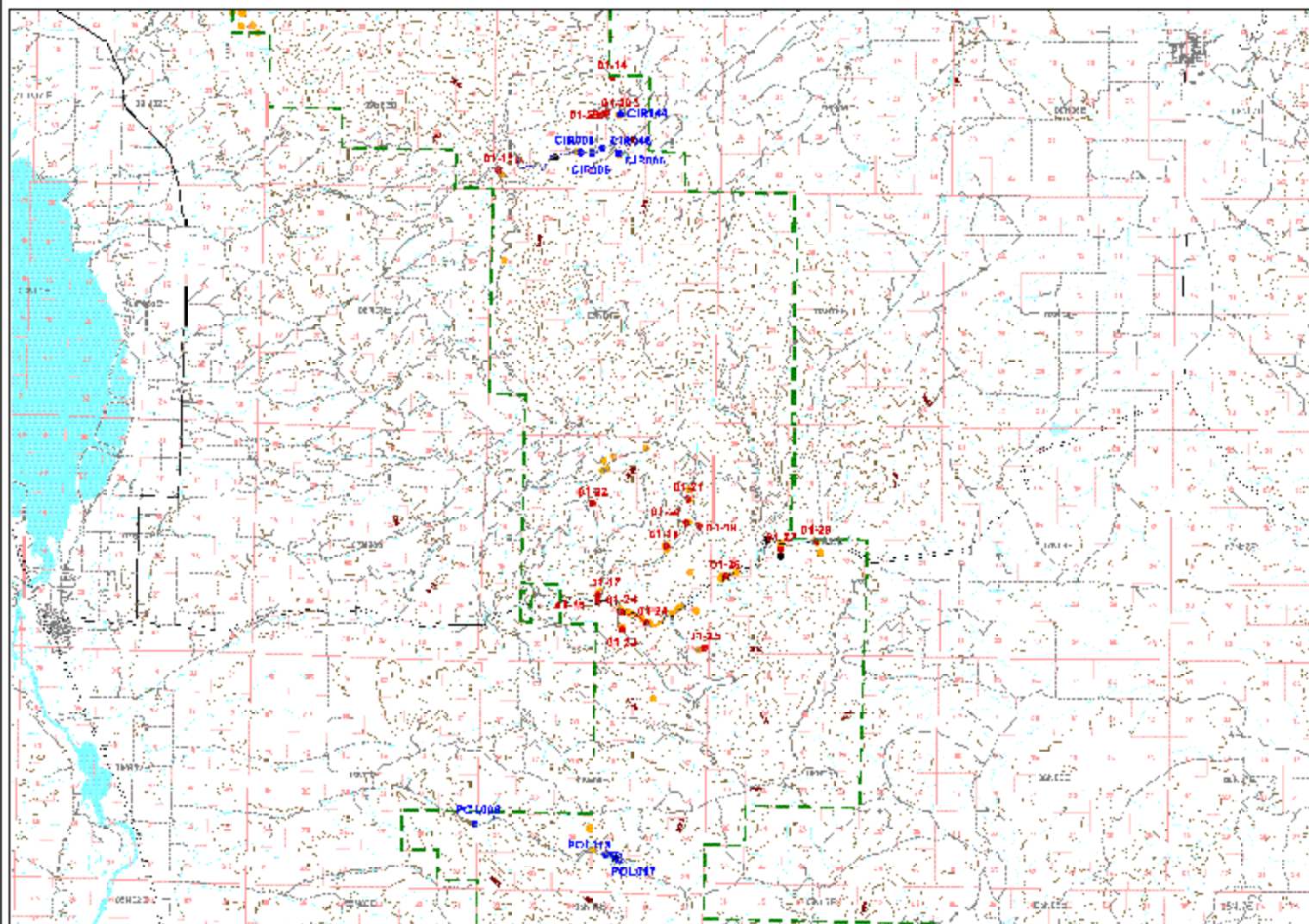
Elevation, slope, aspect, soil type, and vegetation of known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species
- Helena National Forest
- Road System
  - Primary Road
  - Secondary Road
  - Local Road
  - Other Roads
- Contours (m)

0 0.5 1.0 2.0 Miles



# Inset H



This map illustrates the intersection of potential habitat and planned weed treatment areas, mapped by the USFS.

Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program database, as of July 2007.

Elevation, slope, aspect, soil type, and vegetation at known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species

■ Helena National Forest

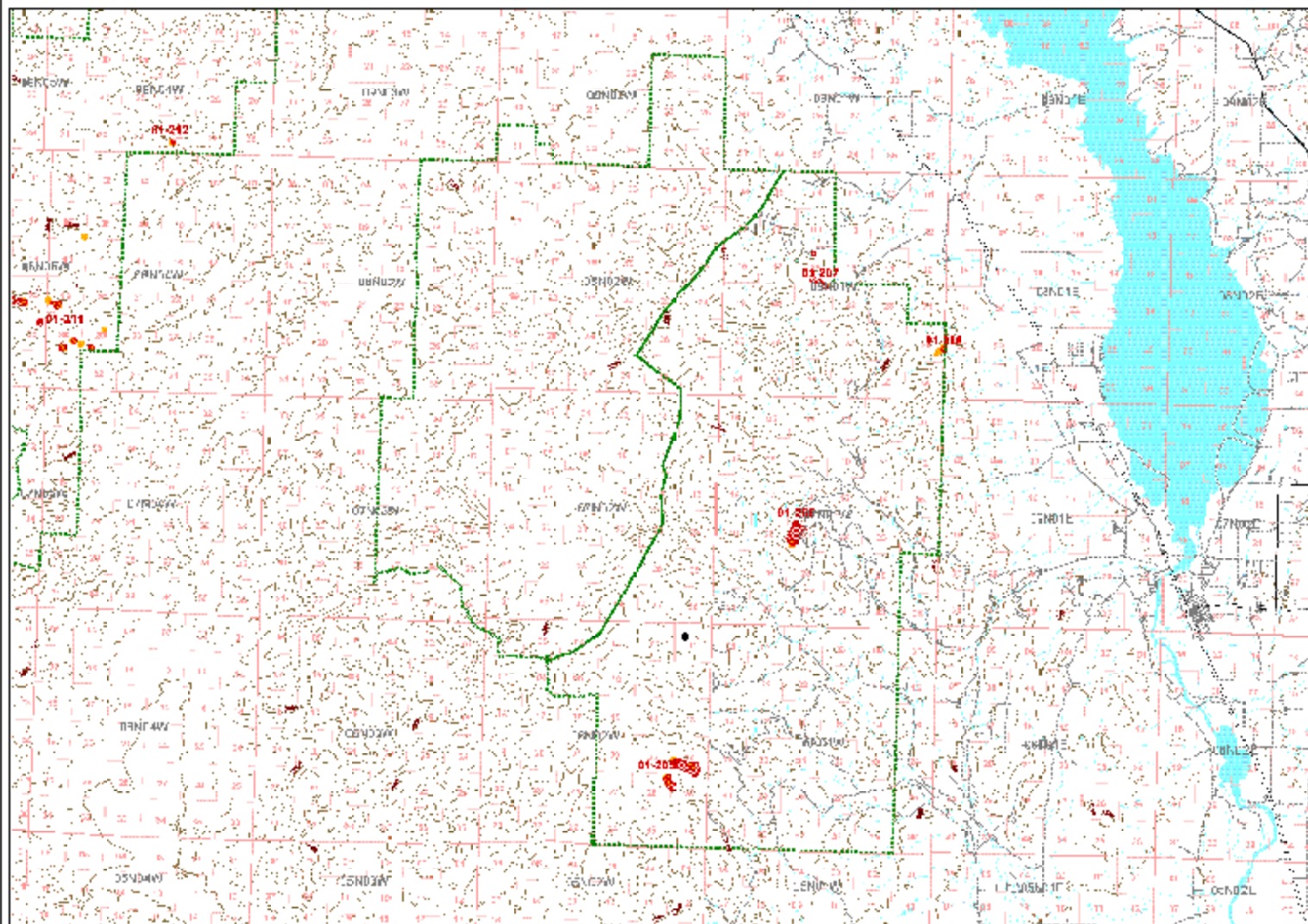
- Road System
- Primary Road
  - Secondary Road
  - Local Road
  - Other Roads
  - Contours (m)

0 0.5 1.0 Miles





### Inset I



This map illustrates the intersection of potential habitat and paired-weed treatment areas, mapped by the USFS.





Areas of potential habitat were based on known locations of the target species, as documented in the Mohave Natural Heritage Program database, as of July 2021.

Elevation, slope, aspect, soil type and vegetation at known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations
- Weed Treatment Areas in Potential Habitat for Target Species

☐ Helena National Forest

Road System

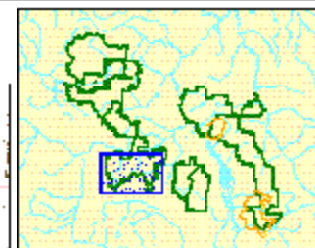
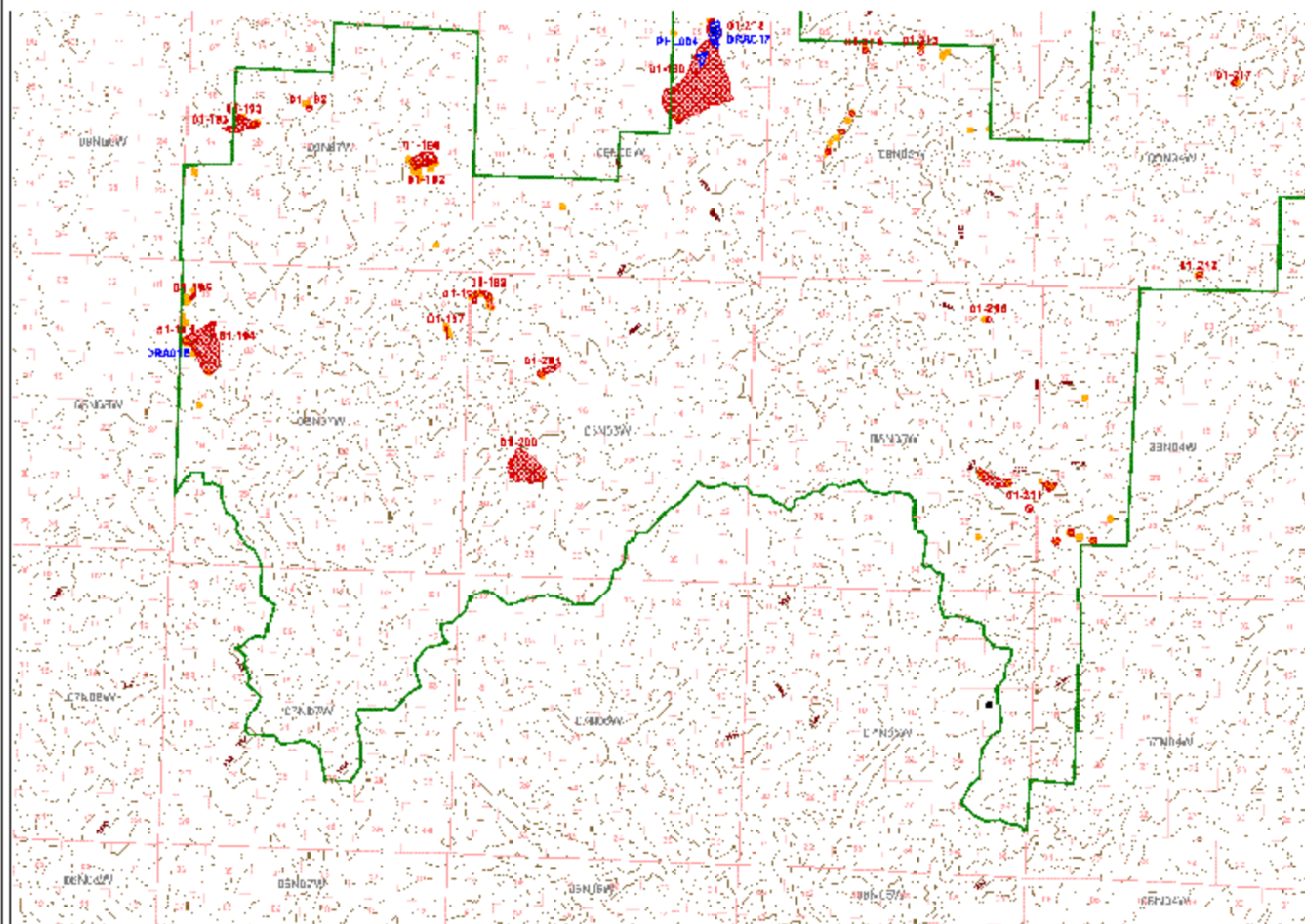
-  Primary Road  
 Secondary Road  
 Local Road  
 Other Roads

• Continue (10)

■ 05 16 May



## Inset J



This map illustrates the intersection of potential habitat and planned weed treatment areas, mapped by the USFS.

Areas of potential habitat were based on known locations of the target species, as documented in the Montana Natural Heritage Program database, as of July 2001.

Elevation, slope, aspect, soil type, and vegetation of known locations were used to determine potential habitat for target species within the Helena National Forest.

- New Species Locations
- Survey Locations
- Previously Known Species Locations

Weed Treatment Areas in Potential Habitat for Target Species

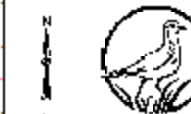
Helena National Forest

Road System

- Primary Road
- Secondary Road
- Local Road
- Other Roads

Contours (m)

0 0.7 1.4 Miles





## **Appendix C - Selected photos of EO Sites**

*Phlox kelseyi* var. *missoulensis*



*Phlox kelseyi* var. *missoulensis*



EO.#014 Austin-Mullan Pass by train trestle



*Phlox kelseyi* var. *missoulensis*



EO.#016 Elk Ridge area



*Cirsium longistylum*



EO.#054 Elk Hill, Jim Ball Basin Area

*Cirsium longistylum*



EO.#054 Elk Hill, Jim Ball Basin Area



*Astragalus convallarius* var. *convallarius*





*Draba densifolia*



EO.#016 Spotted Dog area



*Polygonum douglasii* ssp. *austinae*



EO.#005 *Polygonum douglasii* ssp. *douglasii* Dry Creek Road



*Polygonum douglasii* ssp. *austinae*

